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The Nature and Use of a Soil Survey[1]

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Soil is our most valuable resource. It is basic to all life processes. It is the medium for growing food and fiber. It provides the foundations for homes, stores, factories, schools, airports, roads, and playgrounds.

Because of the varying factors that contribute to the development of soil, the soil itself varies considerably in its individual properties and its response to various uses. It is important to understand the properties of each soil so that proper use and management can be planned. To consider soil properly for any planning or development, an inventory must be made to determine the location and extent of the various kinds of soil. This inventory is called a soil survey.

WHAT IS A SOIL SURVEY?

A soil survey is an acre-by-acre inventory of the soil resource. It is developed by a professional soil scientist who covers the land on foot, examines the soil in detail, and classifies it according to a national system of soil taxonomy. The location of each kind of soil is plotted on aerial photographs. Each soil is then interpreted or translated in regard to how it will respond when subjected to various uses and management. Soil maps and interpretations are made readily available to the users. When a county has been completely surveyed, the soil survey is published by the U. S. Government Printing Office.

WHAT DOES A PUBLISHED SOIL SURVEY CONTAIN?

The soil survey is normally published on a county basis; however, other geographic or physiographic areas may be used as a publication area.

The published survey contains:

1. A complete set of soil maps of the county printed on an up-to-date aerial photo base.
2. A colored soil association or general soil map for broad planning purposes.
3. Technical and popular descriptions of all the soils mapped in the county.
4. Soil interpretations for various agricultural and nonagricultural uses in narrative and table forms.
5. Soil characterization data of the more important soils of the area, describing their physical, chemical, and mineralogical properties.

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ARE THERE DIFFERENT KINDS OF SOIL MAPS?

Soil scientists develop soil maps with varying degrees of detail and scales, depending on the needs of the user (See Table 1 and Table 2). Thus, it is important that the user understands the kind of soil map required to meet his or her needs and the limitations of each type of map. A brief discussion of the various soil surveys developed in Florida follows.

Detailed soil maps

Modern detailed soil surveys are mapped and published on an aerial photo base, usually at a scale of 1:20,000 (or 1 inch on the map equals 0.32 mile on the ground). In developing the modern soil survey, the soil scientist covers the land on foot and actually observes the soil boundaries in the field and plots them on an aerial photo base. The detailed soil survey can be used for operational or detailed planning; but it does not completely eliminate the need for on-site sampling, testing, and study of specific sites for the design and construction of engineering works, and for other intensive uses.

General soil maps

These maps, intended for broad land-use planning, are useful in forming a general picture of the soils in an area. They are used to compare soils in different parts of a county, state, or country. General soil maps are most useful for locating large areas of certain soil conditions, but cannot be used for detailed planing of any specific site. Examples of general soil maps are as follows: soil map of the United States at a scale of 1:7,500,000; soil map of Florida at a scale of 1:1,000,000; soil map of a county at a scale of 1:200,000 (or 1 inch equals approximately 3 miles).

Reconnaissance soil maps

Reconnaissance soil surveys have been made and published for several counties. Soil maps accompanying such surveys were made by the soil scientist covering the land only at intervals so not all soil boundaries were observed. In addition, a number of other counties have old published surveys that are the forerunners of our modern soil surveys. They were developed primarily in the early 1900s; the maps were published at a scale of 1 inch = 1 mile and do not have an aerial photo base. Generally, these soil maps are not adequate for detailed planning, though they may be useful for general planning with proper interpretations by a soil scientist familiar with the area.

Other soil maps

The revised Soil Survey Manual proposes five levels (or orders) of soil surveys with a description of the field procedures used to create maps in varying degrees of detail as presented in Table 1.

WHO USES THE SOIL SURVEY?

For many years, soil surveys have been used by farmers and ranchers to determine the capability of the soil to support certain kinds of crops, and for installing soil and water conservation systems. Surveys are still of extreme value for these uses. In more recent years, however, the value of soil survey information has been realized by many nonagricultural users. Experience gained from electing soils for farming, ranching, and forestry is being applied equally well to selecting sites for housing, highways, airports, schools, factories, parks, cemeteries, recreational areas, and other uses.

Florida is obtaining many benefits from its soil survey program. Following is a brief summary of how soil survey information is utilized by various groups.

Planners.To prepare comprehensive and operational plans; site selection for subdivisions, schools, airports, roads, and transmission lines; dedication of prime lands for appropriate uses; implementation of state legislation under The Comprehensive Planning Act, The Water Resources Act, and The Environmental Land and Water Management Act.

Engineers and architects.To determine soil limitations for building and development and prepare designs that will overcome soil-related problems.

Appraisers and assessors.To make fair and equitable land evaluations for forest and cropland.

Farmers and foresters.To evaluate the capability of a soil to produce certain food, fiber, and wood crops; also to determine the soil and water conservation practices necessary to maintain the soil.

Sanitarians.To determine the limitation of the soil for septic tank filter fields, sanitary landfill sites, and waste water renovation.

Ecologists and environmentalists.To understand and plan the wise and orderly use, management, and conservation of soil and water resources.

Educators.To use soil information in the classroom for a better understanding of the soil and its management.

Realtors and developers.To plan housing and commercial developments, and to assist clients in selecting homesites without soil-related problems.

SOIL SURVEY COST/BENEFIT RATIO

A soil survey is an investment that will certainly pay for itself many times over. Figures on the cost of making surveys and the benefits derived from their use translate into cost/benefit ratios on the order of at least 1 to 45 (1:45). A study by the Director of Soil Survey Interpretations, Natural Resources Conservation Service, Washington, DC, on three different land areas, grouped according to the intensity of the land use, revealed the average cost/benefit ratios of the soil survey as follows:

Low intensity areas, predominantly used for range and woodland, had a cost/benefit ratio of 1 to 46.

Medium intensity areas, used for mixed agriculture with about one-half in cropland, had a cost/benefit ratio of 1 to 61.

High intensity areas, consisting of fringes of rapidly growing metropolitan areas (with about one-fourth urbanized), had a cost/benefit ratio of 1 to 123.

The relatively low initial cost of a soil survey is quickly offset by the benefits (financial and other) that come from the use of the right soil for the right purpose, or at least understanding possible natural soil limitations prior to site planning and develop-ment.

WHO IS RESPONSIBLE FOR SOIL SURVEYS?

The Florida Agricultural Experiment Stations and the USDA Natural Resources Conservation Service have the joint authority and responsibility for all soil surveys in the state. Florida Law 604, enacted by the Florida Legislature in 1941, provided for a statewide soil survey and stated that "the Agricultural Experiment Station of the University of Florida shall administer this law and shall be responsible for the general supervision of this cooperative enterprise between and among federal, state, county, and local agencies; and that it be charged with the duty of developing an energetic soil survey program for the state accordingly as funds are made available for this purpose from federal, state, county, or other sources." Public Law 46--74th Congress, 16 U.S.C. (590-A-P) and Memorandum No. 1318 by the Secretary of Agriculture, dated October 4, 1952; and Memorandum No. 1320, Supplement 4, dated November 2, 1953, give federal responsibility to the Natural Resources Conservation Service for all soil survey activities of the USDA.

A memorandum of understanding has been prepared between the Natural Resources Conservation Service and the Agricultural Experiment Stations declaring the intent of the agencies to cooperate fully in the soil survey program in Florida. Major areas of responsibility have been divided between these agencies. The Natural Resources Conservation Service is responsible for the field mapping and publication of the soil survey. The Florida Agricultural Experiment Stations, through the Soil and Water Science Department, operate a soil characterization laboratory that is a vital part of the State Soil Survey Program. Soil profile samples are obtained of the major kinds of soil in each county or area in which a modern progressive (detailed) survey is being made. Complete physical, chemical, and mineralogical determinations are made for individual

horizons (layers) in each profile. These analyses aid in ensuring proper classification and provide the basis for predicting soil behavior and making interpretations.

WHERE MAY A SOIL SURVEY BE OBTAINED?

Soil surveys are published in a regular USDA series by the Natural Resources Conservation Service on areas that generally follow county boundaries. Not all counties have a modern detailed soil survey, but work is progressing to provide such coverage in the near future. Information as to the availability of a soil survey for any desired area may be obtained from the Extension Director of the county in which the area is located, the Soil and Water Science Department at the University of Florida, the local Soil and Water Conservation District office, or the Natural Resources Conservation Service with state headquarters in Gainesville, Florida.

Table 1. Five orders (levels) of soil surveys with the field procedures used to create maps in varying degrees of detail.

Order of soil survey	Kinds of maps units	Kinds of components	Field procedures	Appropriate scales for field mapping and published maps	Minimum size delineation
1st Order	Mainly consociations and some complexes	Phases of soil series	The soils in each delineation are identified by transecting and traversing. Soil boundaries are observed througout their length. Air photo is used to aid boundary delineation.	<1:12,000	<1.5 acres
2nd Order	Consociations, associations, and complexes	Phases of soil series	The soils in each delineation are identified by transacting and traversing. Soil boundaries are plotted by observation and interpretation of remotely sensed data. Boundaries are verified at closely spaced intervals. Most modern county soil surveys are 2nd order.	1:24,000 to 1:31,680	1.5 acres to 10 acres
3rd Order	Associations and some con-sociations and complexes	Phases of soil series and soil families	The soils in each delineation are identified by transecting, traversing, adn some observations. Boundaries are plotted by observationa dn interpretation by remotely sensed data and verified with some observations.	1:24,000 to 1:250,000	6 acres to 640 acres
4th Order	Associations with some con-sociations	Phases of sild families and sub-groups	The soils of delineations representative of each map unit are identified and their patterns and composition determined by transecting. Subsequent delineations are mapped by some traversing, by some observation, and by interpretation of remotely sensed data verified by occasional observations. Boundaries are plotted by air photo interpretations.	1:100,000 to 1:300,000	100 acres to 1,000 acres
5th Order	Associations	Phases of subgroups, great groups, suborders, and orders	The soils, their patterns, and their positions for each map unit are identified through mapping selected areas (15 to 25 sq. miles) with 1st or 2nd order surveys, or alternately, by transecting. Subsequently, mapping is by widely spaced observations, or by interpretation of remotely sensed data with occaisional verification by observation or traversing.	1:250,000 to 1:1,000,000	640 acres to 10,000 acres

Table 2. According to the classifications in Table 1, the different kinds of soil maps would be placed into the following orders.

Example	Order	Scale (approx.)
Experiment station plots	1st	1:8,000
Modern detailed soil map	2nd	1:20,000
Soil association map	4th	1:250,000
General soil map of Florida	5th	1:1,000,000